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Original Article

The significance of information and communication technology education via tablets in college of physical therapy

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Abstract. [Purpose] This study aimed to clarify whether collaborative learning could be promoted via information and communication technology education using tablets at college of physical therapy. [Participants and Methods] An online survey was conducted to evaluate collaborative learning among 81 first-year students at the Department of Physical Therapy actively using tablets in classes (six specific categories). [Results] The Friedman test had significant results, and a significant primary effect was observed between each questionnaire item. Following this, the Bonferroni test was performed for multiple comparisons, with significant differences were observed among certain items. [Conclusion] We reported employing tablets in the classroom positively impacted collaborative learning. Here, among the evaluations of collaborative learning, the items with the best results corresponded mainly to communication activation between students.

Key words: Information and communication technology (ICT) education, Tablet, Collaborative learning

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INTRODUCTION

In recent years, information and communication technology (ICT) education has been widely incorporated into educational settings[1)]. ICT education is the generic name for ICT itself as well as initiatives used in educational settings[1)]. Along with the development of ICT, there is huge potential for the usefulness of ICT education in the future and many countries are laying out policies that aim to encourage its use[1)]. The Ministry of Education, Culture, Sports, Science and Technology[2)] (MEXT) recognizes ICT as an effective tool in order to achieve autonomous, collaborative and bi-directional diverse learning that encourages discovery and solution of issues. In addition, MEXT[2)] report that it is necessary to promote high-quality ICT education while recognizing the importance of face-to-face instruction between teachers and students. As concrete results of ICT education, MEXT[3)] stated that it is possible for students to acquire knowledge and skills through comprehension at their own pace and, through easy repetition of trial study tasks using digital teaching materials, interest in study tasks increases and it becomes possible to obtain a deeper comprehension. In addition, Wu[4)] states that mutual communication between teachers and students and among the students themselves can be encouraged through ICT education using tablets.

In the rehabilitation field, specific initiatives in ICT education using tablets including inverted classes[5)] in which students study at home before class and then practice and discuss in class, and class material distribution, video transmission and videoing of practice[6)] using the internet are used. The majority of students who took the class had opinions such as, "I learned

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a lot" and "It was easy to work on"[5, 6]. In many of the inverted groupwork classes using tablets implemented by Nakada et al.[7], it was reported that cognitive domain educational effects were acknowledged. In the future, as ICT education progresses even further, investigating the educational effects of using tablets will be important. Here, one of the effects of ICT education is collaborative learning in which students group work or learning from each other[8, 9]. MEXT[8] aims to promote personal learning that responds to the skills and characteristics of each individual and collaborative learning in which students teach each other and learn together using ICT and has been promoting the Learning Innovation Project with ICT since 2011. Based on a survey of over 17,000 people, they have published a survey about the evaluation of personal learning and collaborative learning using tablets[10].

The college of physical therapy surveyed this time actively introduced tablets to classes several years ago. The aim is to promote collaborative learning among students as active learning. Active learning is the name for teaching and learning methods that incorporate active student participation in learning[11]. It is regarded that it is necessary to incorporate active learning techniques that suit learning goals and what learning results that can be achieved depending on what kind of tasks are given[9]. In general, it is considered that comprehension of learning contents is promoted as a result of collaborative learning[9].

In classes than focus on lectures and classes that focus on practice at the college of physical therapy, tablets have been actively used for investigative learning and taking photos and videos but it was not confirmed whether this actually encouraged collaborative learning. In study in the field of rehabilitation, it is important to cooperate with other people but few studies have examined whether collaborative learning can be promoted using tablets and what aspects of student learning can be promoted. Therefore, this study aimed to use an existing survey published by MEXT and clarify whether it is possible to encourage collaborative learning through ICT education using tablets.

PARTICIPANTS AND METHODS

We fully explained the point of the study, the method of processing the results, the venue for the presentation of the study results and the fact that participants will remain anonymous in the presentation to 88 first year students on the day courses at the college of physical therapy. Following that, 81 students agreed to take part in the study and filled in the survey (response rate: 92.0%; 38 males/average age 19.8 ± 1.7 years, and 43 females/average age 19.2 ± 0.8 years). It should be noted that this study was carried out with the approval of the ethics committee of the research collaboration facility (Approval No. FW-21-02).

The college of physical therapy has a good Wi-Fi environment and all participating students had their own tablet (iPad) so it was possible to connect to the internet freely by entering the password in advance. In lecture classes in this study, groups researched anatomy and pathology in order to improve comprehension of ailments, and the right or wrong answers to national exam questions, and, at the end, shared this knowledge within the group. Furthermore, class materials were distributed and notes were taken directly on tablets. In practice classes, students took photos and videos of each other during practice and, after sharing through tablets, the groups listened to each other's discussions. All faculty members implemented these classes for one year.

At the end of 2020, after explaining to the participants about answering about the educational effects using tablets in classes in the second period (September−December), we conducted an online survey (Google Forms). The contents of the survey were selected from the MEXT[9] Learning Innovation Project Demonstration Study Report. There were six specific categories such as: Do you think you were able to communicate your own thoughts and opinions in an easy-to-understand manner? / Do you think that you were able to discover new ways of thinking, rules, methods and principles, etc. in classes? (Table 1) Here, it is considered that the following are applicable: 1. communication of items to other people, 2. discovery of new concerns, 3. cooperation between students, 4. students teaching each other, 5. exchange of opinions between students 6. communication between students and teachers (Table 2). In advance, we explained enough to the students to answer about the effect of collaborative learning. The survey had 10 point scale (1: no; 10: yes) and the students filled it in. The reason for

Table 1. The contents of the survey and results

Number	Contents	Results
1.	Do you think you were able to communicate your own thoughts and opinions in an easy-to-understand manner?	7 (5–8)*
2.	Do you think that you were able to discover new ways of thinking, rules, methods and principles, etc. in classes?	7 (5–8)†
3.	Do you think you were able to progress with study through cooperation with your friends in classes?	8 (7–10)*, †, ‡
4.	Do you think you and your friends were able to teach each other in classes?	8 (6–9)*, †, ‡
5.	Do you think that knowing your friends' ways of thinking and opinions furthered your learning?	8 (7–9)*, †, ‡
6.	Do you think the students were able to participate in lively exchange with teachers in classes?	7 (6–9)‡

Median (1st quartile–3rd quartile).
*$p<0.01$ (1 vs. 3, 4, 5), †$p<0.01$ (2 vs. 3, 4, 5), ‡$p<0.01$ (3, 4, 5 vs. 6).

Table 2. Expected learning effect in collaborative learning

Number	Expected learning effect
1.	Communication of items to other people
2.	Discovery of new concerns
3.	Cooperation between students
4.	Students teaching each other
5.	Exchange of opinions between students
6.	Communication between students and teachers

using the 10 point scale was to reflect minute differences in responses in the results[12]. For statistical analysis, after comparing the questionnaire results for each item using the Friedman test, the Bonferroni test was used for multiple comparison. EZR (version 1.55) was used for statistical analysis, and the significance level was set at 5%.

RESULTS

The values for the survey result of 10 point scale were high on the whole at 7 or 8. The Friedman test had significant results ($p<0.01$), and a significant primary effect was observed between each questionnaire item. Following this, the Bonferroni test was performed for multiple comparisons, with significant differences were observed among certain items ($p<0.01$, Table 1).

DISCUSSION

The college of physical therapy actively introduced tablets to classes several years ago. This study aimed to investigate whether collaborative learning, which was the goal of introducing tablets, was encouraged. Here, from the results of the questionnaire, the approach of this study could be generally effective in promoting collaborative learning as active learning. In addition, significant differences were observed among certain items in the questionnaire results. Here, the items with the best results corresponded mainly to communication activation between students. Among the items corresponding to communication between students, the result of 3. cooperation between students, was considered to be the highest. It was suggested that, in the method of using tablets like this study, the attitude of students to cooperate with each other and work on problem solving may be fostered even in collaborative learning. By using tablets, it becomes easier to visually share each other's thoughts, deepen discussions within the group, and facilitate the exchange of opinions. MEXT[3] stated that communication will be activated by working while grasping each other's progress on learning tasks using tablets. From these results, it became clear that ICT education using tablets can encourage collaborative learning.

In education in the field of rehabilitation, it is considered that memorization is important for personal learning in the first stage in which it is possible to learn developmentally by oneself[13]. Meanwhile, it is reported that personal learning and memorization are useful for the early stages of learning but in order to encourage active learning and sustain knowledge, it is indispensable to progress with collaborative learning while communicating among students[14]. The effects of collaborative learning when compared with personal learning are stated by Männistö et al.[15]: many positive effects such as spontaneous learning, the promotion of creative activities due to inspiration from others and understanding of others. Pires et al.[16] report a significant increase in memory results.

The features of tablets that link to collaborative learning are listed as group discussion and exchange of opinion, analysis and collaborative production, etc. by MEXT[8]. Saito[17] pointed out that taking photos and playing videos and the ease of sharing data are advantages of tablets. At the college of physical therapy actively introduced tablets to classes several years ago, guidance for active communication among students while making use of the features and advantages of these tablets is given and was considered to link to the promotion of collaborative learning as a result. This suggests the possibility of promoting educational goals such as memorizing knowledge and comprehension the meaning of what has been learned, even in the cognitive domain. General issues in the introduction of tablets in classes include the burden on teachers and ICT literacy of students. In addition to furthering teachers' understanding of equipment use, it is considered that it is necessary to give guidance to students on ICT literacy.

One of the limits of this study was that it was unable to compare before and after the introduction of tablets. Therefore, we would like to consider this as an issue for future study. In addition, only 1st year students were included in the study. In the future, we would like to repeat the same study on 2nd and 3rd year students and compare the differences between year groups. The corporation that runs the college of physical therapy owns several other physical therapy vocational schools. Using the advantage of scale, we would like to investigate further, increasing the number of participants in the future.

Conflicts of interest

None.

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